



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/532,084	04/21/2005	Takashi Yasumura	80346(47762)	6480
21874 7590 03/17/2010 EDWARDS ANGELL PALMER & DODGE LLP P.O. BOX 55874 BOSTON, MA 02205				
EXAMINER				
WU, IVES J				
ART UNIT		PAPER NUMBER		
1797				
MAIL DATE		DELIVERY MODE		
03/17/2010		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary****Application No.**

10/532,084

**Applicant(s)**

YASUMURA ET AL.

**Examiner**

IVES WU

**Art Unit**

1797

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 December 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3,5 and 9-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,5,9-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/GS/US)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

- (1). Applicants' Amendments and Remarks filed on December 23, 2009 have been received. Claim 8 is cancelled. Total cancelled claims are 4, 6-8 and 20.

Claim 1 is amended.

The rejections of claims 1-3, 5, 8-20 in prior Office Action dated 9/23/2009 is withdrawn in view of present Remarks.

However, a new ground of rejection for claims 1-3, 5, 9-19 is introduced as follows.

### *Claim Rejections - 35 USC § 103*

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

- (2). **Claims 1-3, 5, 9-19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura et al (US20020055030A1) in view of Butler (US6251308B1), Hirai et al (US 20020132118A1).

As to component (A) of a conductive filler in a conductive resin composition in **independent claim 1**, Okumura et al (US20020055030A1) disclose the electro-conductive agent, a variety of components such as carbon powders, carbon fibers and metal powders can be employed ([0015], line 1-7).

As to component (C) of a (meth)acrylate to be a reaction product obtained by reacting a polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit with a (meth)acrylic acid, or a reaction product obtained by reacting a polyisocyanate having an aromatic cyclic structural unit and/or an aliphatic structural unit with a polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit under the conditions that an isocyanate group of the polyisocyanate is in excess of a hydroxyl group of polyol, with a (meth)acrylate having a hydroxyl group in **independent claim 1**, Okumura et al (US20020055030A1) disclose conventional urethane (meth)acrylate formed by polyurethane oligomer and hydroxyC<sub>2-6</sub>alkyl (meth)acrylate. The polyurethane oligomer includes a reaction product of diisocyanate and polyether diols such as polyoxyC<sub>2-4</sub>alkylene glycols. The molar

ratio of hydroxyl group to isocyanate group of the urethane oligomer is about 0.7/1 to 1.2/1 ([0049]). Therefore, the excess isocyanate group would completely reacted with hydroxyl group of (meth)acrylate, so that no active hydrogen atom is left. Okumura et al **do not teach** alicyclic or aromatic polyether diol claimed.

However, Hirai et al (US 20020132118A1) **teach** photocurable resin composition (Title). In particular, the curable composition is a liquid curable composition that can be formulated for use in a wide variety of applications including, for example, coatings and/or binders ([0001], In 5-8). It may contain urethane (meth)acrylate other than urethane (meth)acrylate prepared using 12-hydroxystearic acid triglyceride or hydrogenated castor oil as a raw material ([0048]. Conventionally known urethane acrylates prepared by reacting a hydroxyl group-containing (meth)acrylate and a polyisocyanate or reacting a hydroxyl group-containing (meth)acrylate, polyisocyanate, and polyol, for example, can be used as such a urethane (meth)acrylate. A polyether diol, polyester diol, polycarbonate diol, polycaprolactone diol, and the like can be given as the polyol used for preparing the urethane acrylate by the reaction of hydroxyl group-containing (meth)acrylate, polyisocyanate, and polyol. The polyether diol includes aliphatic polyether diols, alicyclic diols and aromatic diols ([0049],[0051]). These aliphatic polyether diols are also commercially available under trademarks for example PEG1000, PPG400 ([0056]). As examples of the alicyclic polyether diol, alylene oxide addition diol of hydrogenated bisphenol A, alkylene oxide addition diol of hydrogenated bisphenol F ([0057]). As examples of aromatic polyether diol, alkylene oxide addition diol of bisphenol A, alkylene oxide addition diol of bisphenol F, alkylene oxide addition diol of hydroquinone ([0057]). Among the above polyether polyols, polyester polyols, polycarbonate polyols, and polycaprolactone polyols, polyether polyols are desirable because polyether polyols can produce polyurethanes with excellent durability and superior low temperature characteristics ([0063]).

Therefore, it would have been obvious at time of the invention to substitute the polyoxyC<sub>2-4</sub>alkylene glycols disclosed by Okumura et al with the alicyclic polyether diol or aromatic polyether diols disclosed by Hirai et al based on their interchangeability as recognized functional equivalence as polyether diol in conventional urethane (meth)acrylate composition. Further, the polyether diols disclosed by Okumura et al is genus, the aliphatic polyether diols, alicyclic polyether diols, aromatic polyether diols disclosed by Hirai et al are genus, one of

ordinary skills in the art would recognized that all species works well for genus. Motivated by a reasonable expectation of success. *In O'Farrell*, 853 F.2d 894, 903, 7 USPQ 2d 1673, 1681 (Fed. Cir. 1988).

As to the component (C) of a (meth)acrylate having a  $M_n$  of 500 to 10,000, which containing 20 to 80 wt% of an aromatic cyclic structural unit in **independent claim 1**, in view of substantially identical (meth)acrylate disclosed by prior art, and by applicants, it is examiner's position to believe that the (meth)acrylate of prior art would inherently possess  $M_n$  and aromatic structural unit as claimed. Since USPTO does not have facilities necessary to conduct the measurements. The burden now is shifted to applicants to prove otherwise. *In re Best*, 562 F.2d 1252, 195 USPQ 430 (CCPA 1977).

As to component (B) a urethane-modified epoxy (meth)acrylate obtained by reacting an epoxy (meth)acrylate (b-1) with a polyisocyanate (b-2); the epoxy (meth)acrylate (b-1) being obtained by an addition reaction of an epoxy resin having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit and a (meth)acrylic acid in a conductive resin composition in **independent claim 1**, Okumura et al (US20020055030A1) disclose radical-polymerizable resins, for example, vinyl ester-series resins, urethane (meth)acrylates and the like, **can be used singly or in combination** ([0018]). Vinyl-ester series Resin (e.g., epoxy (meth) acrylate) is a ring-opening and addition reaction product of an epoxy group with a carboxyl group of a compound having a  $\alpha$ ,  $\beta$ -ethylenically unsaturated bond, and is an oligomer having a  $\alpha$ ,  $\beta$ -ethylenically unsaturated bond such as (meth)acryloyl group at its terminal position ([0020]. As the alicyclic epoxy resin, there may be mentioned, for example, alicyclic epoxy acetal, alicyclic diepoxy adipate and the like ([0025]). Okumura et al (US20030055030A1) **do not teach** the urethane-modified epoxy (meth)acrylate as claimed.

However, Butler (US 6251308B1) **teaches** highly conductive molding compounds and fuel cell bipolar plates comprising these compounds (Title). One component of a molding resin composition is a cross-linkable prepolymer such as an unsaturated polyester resin or **vinyl ester resin** (Col. 4, line 1-3). In general, the vinyl ester resins that can be used are the reaction products of epoxy resins and a monofunctional ethylenically unsaturated carboxylic acid. More specifically, these vinyl ester resins are the reaction product of an epoxy terminated oligomer, for example, an epoxy functionalized bisphenol A with an acrylic acid, or methacrylic acid forming

acrylic terminal groups on the oligomer. The vinyl esters have predominantly terminal unsaturation while the unsaturated polyesters have predominantly internal unsaturation (Col. 4, line 15-24). An essential component to the improved molding composition is a rheological modifier, which may act to increase the molecular weight such as by chain extension of the resin prepolymer. Suitable modifiers include polyisocyanates. It is believed that the foregoing **modifiers act chemically by co-reacting into the polymer backbone at carboxy or hydroxyl sites** (Col. 5, line 20-27). The modifiers are further used in general to enable the achievement of a high definition conductive polymeric fuel cell plate (Col. 5, line 40-42). Resin A is Hetron 922 available from Ashland Chemical Co. in Columbus Ohio. It is a low viscosity epoxy vinyl ester resin (Col. 7, line 54-57).

The advantage of urethane-modified vinyl-ester resin is to get a higher glass transition temperature and resulted in an improvement in the hot strength of the molded part. Further improvement are also possible by optimizing both gel time and cure time for the prepolymer by controlling initiator type and amount (Col. 3, line 35-41). Further these compositions enable the production of thin and intricate specimens that have high concentrations of conductive filler (Col. 3, line 59-61). In this application they are used to modify the resin structure to prevent phase separation of the resin from the conductive filler (in particular in view of the high loadings of the conductive filler, i.e. over 50% or even 65% by weight or more of graphite). The modifiers are further used in general to enable the achievement of a high definition conductive polymeric fuel cell plate (Col. 5, line 36-42).

Therefore, it would have been obvious to use urethane-modified vinyl ester resin disclosed by Butler for the vinyl-ester resin of Okumura et al for a combination with Urethane (meth)acrylate in order to attain the above-cited advantages.

As to component (D) of other ethylenically unsaturated monomer in **independent claim 1**, and **claim 11**, Okumura et al (US20020055030A1) radical-polymerizable diluent such as aromatic vinyl ester, in particular, styrene ([0058]-[0060]).

As to the epoxy(meth)acrylate having a hydroxyl value in the range of 100 to 300, the molar ratio of moles of hydroxyl group of the epoxy (meth)acrylate to moles of isocyanate group of the polyisocyanate being within the range of 1.0/(0.5 to 1.5) in **independent claim 1**, Butler (US06251308B1) discloses desirable amounts of polyisocyanate modifiers to be from about 1 to

about 15 weight percent. This can also be expressed as from about 0.5 to about 20 phr (Col. 6, line 7-13), it would meet the range of mole ratio as claimed. In view of the substantially identical epoxy (meth)acrylate disclosed by Applicants, and by prior art, it is examiner's position to believe that the epoxy (meth)acrylate of prior art would inherently possess the hydroxyl value in the range of 100 to 300 as claimed. Since USPTO does not have facilities necessary to conduct the measurements. The burden now is shifted to applicants to prove otherwise. *In re Best*, 562 F.2d 1252, 195 USPQ 430 (CCPA 1977).

As to wherein ratio of the urethane-modified epoxy (meth)acrylate (B) to the (meth)acrylate (C) is from 95/5 to 50/50 in **independent claim 1**, in absence of showing the criticality of the records, the optimization value of ratio between component (b) of urethane-modified epoxy (meth)acrylate and component (c) of (meth)acrylate to be 95/5 to 50/50 in a known process renders *prima facie obviousness* within one ordinary skill in the art. *In re Boesch*, 617 F.2d, 276, 205 USPQ 215, 219 (CCPA 1980).

As to the limitation of **claims 2 and 3**, Okumura et al disclose the novolac type epoxy and other type of epoxy resin in paragraph (3) which includes 30 to 90 wt% of an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit.

As to wherein the polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit is an alkylene oxide adduct of a multinucleate phenolic compound in **claim 5**, Hirai et al (US 20020132118A1) disclose, as examples of the alicyclic polyether diol, alkylene oxide addition diol of hydrogenated bisphenol A, alkylene oxide addition diol of hydrogenated bisphenol F ([0057]). As examples of aromatic polyether diol, alkylene oxide addition diol of bisphenol A, alkylene oxide addition diol of bisphenol F, alkylene oxide addition diol of hydroquinone ([0057]).

As to the limitation of **claim 9**, Okumura et al disclose the wt ratio of the electroconductive agent to the radical-polymerizable thermosetting resin system is from 55/45 to 95/5 ([0063], line 1-3), in other words, the content of component A is to be 55 to 95 wt%. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura et al (US20020055030A1).

As to the limitation of **claim 10**, Okumura et al disclose the thermosetting to be 12 wt%, reactive diluent (styrene) to be 8 wt%, conductive fillers to be 80 wt% in Example 2, it would be

obvious to have the distribution of components B, C such as 6 wt% of B and 4 wt% of urethane-(meth)acrylate C taught by Okumura to be within 12 wt% and to meet the instant claim.

As to limitation of **claims 13-19**, Okumura et al disclose the separator for solid polymer-type fuel cell being produced by molding the resin composition which comprises an electro-conductive agent and a radical-polymerizable thermosetting resin system and a resin molding method (Abstract, line 1-4).

As to components (A) – (D) in 1<sup>st</sup> step method for producing a conductive resin composition in **independent claim 12**, the disclosure of Okumura et al is incorporated herein by reference, the most subject matters of components, and hydroxyl values, molar ratio as currently claimed, have been recited in applicants' claim 1, and have been discussed therein.

As to kneading step in the method in **independent claim 12**, Okumura et al disclose the resin composition is kneaded with the use of conventional kneader ([0082], line 1-2).

As to 2<sup>nd</sup> step of reacting the kneaded mixture at a temperature of room temperature to 80 °C in the method in **independent claim 12**, Okumura et al disclose the reaction for 8 hours at 120 °C in Example 1. In absence of showing the criticality of the records, the optimized reaction temperature ranged from room temperature to 80 °C in the known process renders *prima facie obviousness* within one of ordinary skills in the art. *In re Boesch*, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

### ***Response to Arguments***

(3). Applicant's arguments, see pages 7-10, Remarks, filed 12/23/2009, with respect to the rejection(s) of claim(s) 1 under Okumura et al (US 20020055030A1), Fujimoto et al (WO 02/44285) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Okumura et al (US 20020055030A1), Hirai et al (US 20020132118A1).

Applicant's arguments filed on 12/23/2009 have been fully considered but they are not persuasive. Applicants address the improper combining of Okumura et al (US 20020055030A1) and Butler (US 6251308B1) for the following reason: Butler (US 6251308B1) only discloses the vinyl ester (one of the component (a) and polyisocyanate (one of the component (c)), and does not disclose urethane-modified vinyl ester resin. Again, Butler (US 6251308B1) does not



disclose the component (C). No motivation exists for combining Okumura and Butler which does not disclose component (C). Specifically, Okumura et al (US 20020055030A1) discloses that radical-polymerizable thermosetting resin system may be: A, B, C, D, A+B, A+C, A+D, B+C, B+D, C+D, A+B+C, A+B+D, A+C+D, B+D+D, or A+B+C+D. Therefore, the percentage of selecting A+B is only about 7%. There are no Examples in which urethane acrylate is only used, or both vinyl ester resin and urethane acrylate are used in Okumura et al (US 20020055030A1) (pages 6-7, Remarks).

However, the combination of vinyl ester series and urethane (meth)acrylate resin disclosed by Okumura et al (US 20020055030A1) is in the sufficient limited combination set, therefore, the selection of this combination (vinyl ester series resin and urethane (meth)acrylate is anticipated. See MPEP §§ 2144.08, 2131.02. Further, disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. *In re Susi*, 440 F.2d 442, 169 USPQ 423 (CCPA 1971). Butler (US 6251308) discloses the urethane modified vinyl ester because the polyisocyanate modifier and the vinyl ester would react and form the urethane (meth)acrylate - component (B) of instant claim 1. Again, the motivation of combining both Okumura et al (US 20020055030A1), Butler (US 6251308B1) teaching is based on the advantages cited in Office Action. Moreover, one can not show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IVES WU whose telephone number is (571)272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1797

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu

Art Unit: 1797

Date: March 9, 2010

/Duane Smith/

Supervisory Patent Examiner, Art Unit 1797